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RUBBLE TO MOUNTAINS

Implemented by IBI Group and Rubble to Mountain

Bakalian Waste Storage Site Sampling Methodology and Analytical Report

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Since 2006, the agency has been present in Lebanon, first involved in recovery and reconstruction efforts in South Lebanon, Beirut, and Northern Lebanon (particularly in the Nahr el Bared Camp crisis response in 2007), and in efforts to improve the living conditions in the 43 Palestinian out-of-camp concentrations. Since 2013, UN-Habitat has been involved in responding to the Syrian refugee crisis, and since 4 August 2020 to the Beirut blast. UN-Habitat, as part of the United Nations in Lebanon, is also part of the concerted effort to support the country navigate the ongoing protracted socio-economic crisis. This is being done through directed and tangible support at the local authority and community level, while maintaining efforts towards establishing principles of good urbanization at the national level, as a key enabler of sustainable development.

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Rubble to Mountains Initiative

To address and prevent some of the foreseeable environmental hazards that would be caused by disposing of rubble left by the Beirut Port explosions into landfills, UN-Habitat in coordination with several partners established the Rubble to Mountains initiative. Through its three-pronged approach, the initiative aims to transform rubble and glass into a biodegradable, sand-like material that will be used to fill holes left by mining in Lebanon's mountains, build furniture for Beirut's public spaces and establish a permanent site for processing waste left by construction and demolition.

Disclaimer

Credits and Acknowledgments

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Acronyms and Abbreviations

ACM	Asbestos-Containing Material
CDW	Construction and Demolition Waste
EPA	Environmental Protection Agency
PCM	Phase Contrast Microscopy
PLM	Polarized Light Microscopy
SEM	Scanning Electron Microscopy
TCLP	Toxicity Characteristic Leaching Procedure
TEM	Transmission Electron Microscopy

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Project Description

1. Introduction
2. Site Description
3. Regulatory Requirements

1. Project Description

1.1. Introduction

Under the guidance of UN-Habitat Lebanon, and as part of the emergency response to the massive explosion at the Port of Beirut on August 4, 2020, IBI Group was commissioned to provide technical oversight and testing for a small-scale trial on the reuse of construction and demolition waste (CDW) for environmentally sustainable urban-restoration developments. This small-scale trial feeds into Rubble to Mountains, a project initiated by UN-Habitat together with the Lebanon Reforestation Initiative and Development Inc. in collaboration with the American University of Beirut Neighbourhood Initiative. The goal of Rubble to Mountains is to prevent an environmental waste crisis by sorting the volumes of rubble, concrete, iron, plastic, glass, and nylon to produce a material for landfilling in mountains severely eroded by quarrying. The purpose of this small-scale trial was to provide consultancy oversight and gather and analyze air and wastewater samples associated with the rubble-crushing operations at the Bakalian storage and disposal site. It is this rubble that will ultimately be used to restore the mountains eroded by quarrying. The samples were analyzed to assess whether the health and safety measures that have been implemented on-site are protecting both the workers and the environment and to determine how the long-term management plan will be executed. In addition to air and wastewater samples, bulk samples were taken during certain stages of crushing operations to better understand the composition of the material.

For this assignment, Mr. Hassan Ktaech of IBI Group, an international asbestos management expert, led the fieldwork sampling program from August 23 to 27, 2021. The methodology of the fieldwork and analysis was based on both Canadian and international best practices and tailored to Lebanese conditions.

This report should be read in conjunction with IBI Group's *Guidelines for Managing Asbestos at the Bakalian Disposal Site*, which was issued on September 9, 2021.

1.2. Site Description

This report provides the sampling results for certain stockpiles located at the Bakalian waste storage site. These stockpiles are located in northeastern Beirut in the Karantina district (Medawar 1343) and face a century-old flour mill, the Bakalian Flour Mills. The site includes four distinct stockpiles of different materials: glass, rubble, mixed 1, and mixed 2 (Figure 1). This report does not include any findings associated with the glass stockpile, as glass-crushing equipment was not installed at the time of IBI Group's site visit.

According to the polygon edit feature within Google Earth Pro software, the area encompasses approximately 18,000 m^2 of land (Figure 2) that falls under the jurisdiction of two entities, the Governor of Beirut and the Port of Beirut. Currently, the site contains approximately 140,000 tonnes of mixed rubble and 20,000 tonnes of glass. To meet project timelines while ensuring that proper safety measures were in place during the sampling for the small-scale trial, only key design elements were installed at the site (Figure 2). These included the decontamination facility, washdown areas, and clear distinctions between clean and dirty zones.

Figure 1. Four Stockpiles at the Bakalian Waste Storage Site / UN-Habitat © 2021

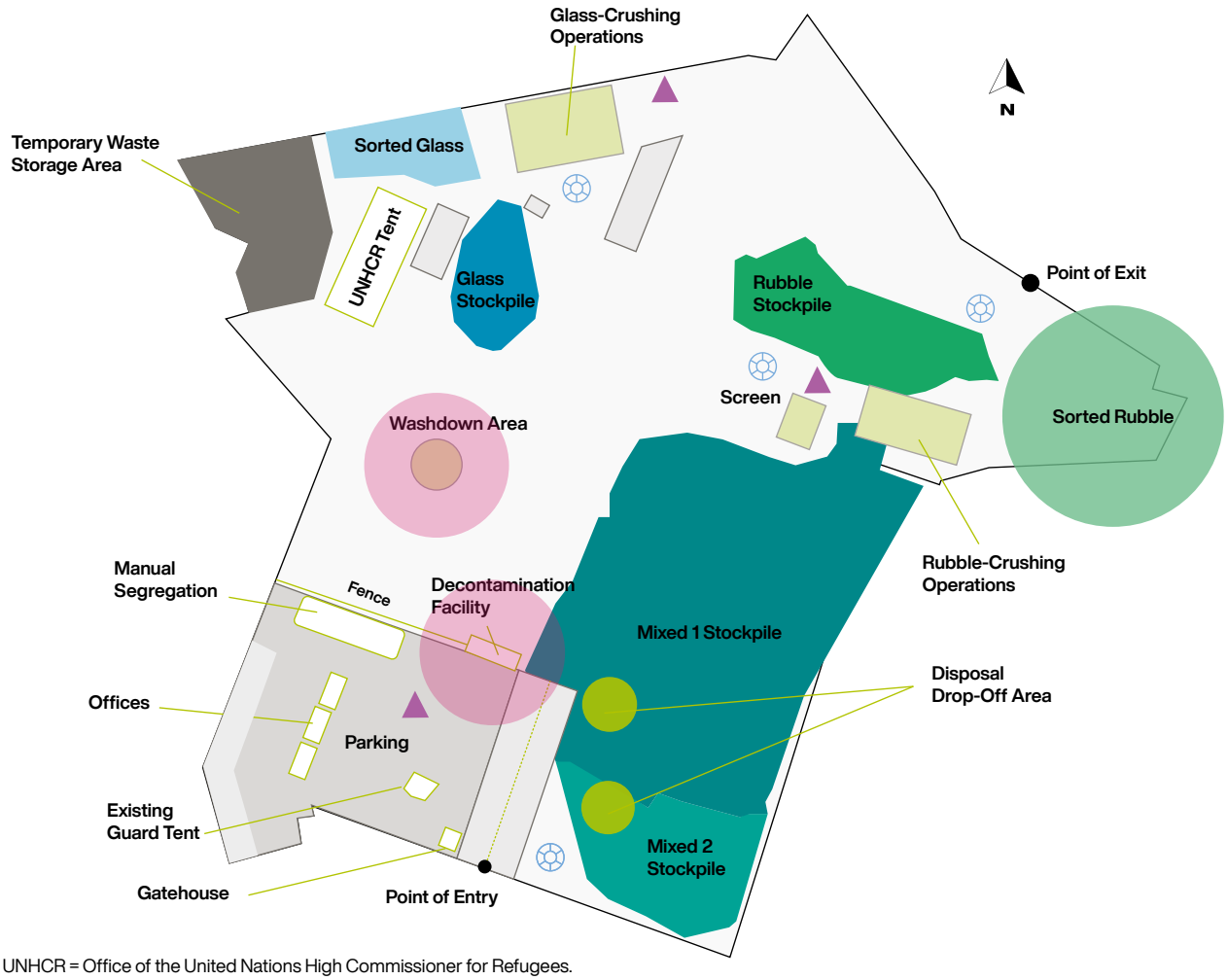
GLASS STOCKPILE

MIXED 1 STOCKPILE

RUBBLE STOCKPILE

MIXED 2 STOCKPILE

Figure 2. Bakalian Waste Disposal Site Plan



UNHCR = Office of the United Nations High Commissioner for Refugees.

1.3. Regulatory Requirements

In keeping with Canadian occupational health and safety legislation and regulations (O.Reg. 278/05 in Ontario and Chapter S-2.1, r.13 in Quebec), as well as UK Health and Safety Executive recommendations, a risk-based and, where necessary, conservative approach has been employed in dealing with the uncertainties associated with protecting workers and the public from contamination at the site.

In addition, this report has been prepared in conjunction with a review of the following Lebanese hazardous waste legislation:

- **Law 444/2002**: Protection of the Environment
- **Decree 5606/2019**: Determination of the Fundamentals of Hazardous Waste Management
- **Decision of the Minister of the Environment, No. 998/1 (December 24, 2019)**: Determination of the procedures and fundamentals for implementing the first chapter (generator and his obligations) of section 2 of the decree, Determination of the Fundamentals of Hazardous Waste Management, No. 5606 (September 11, 2019)
- **Decision of the Minister of the Environment No. 999/1 (December 24, 2019)**: Determination of the procedures and fundamentals for implementing the second chapter (carrier and his obligations) of section 2 of the decree, Determination of the Fundamentals of Hazardous Waste Management, No. 5606 (September 11, 2019)
- **Decision of the Minister of the Environment No. 59/1 (January 1, 2020)**: Determination of the procedures and fundamentals for implementing the first chapter (hazardous waste storage facilities) of section 3 of the decree, Determination of the Fundamentals of Hazardous Waste Management, No. 5606 (September 11, 2019)
- Decision of the Minister of the Environment No. 71/1 (May 19, 1997)
- **Law 387/1994**: Ratification of Basel Convention
- Decision of the Minister of the Environment No. 42/1 (March 26, 1996) banning the import of asbestos (crocidolite type)
- Decision of the Minister of the Environment No. 174/1 (November 2, 1998) banning the import of certain types of asbestos
- **Law No. 64 of 1988**: Protection of the Environment Against Pollution from Hazardous Waste Disposal and Substances

Where national standards are non-existent or incomplete, the most stringent of international standards have been applied. For ambient outdoor air quality, as per US Occupational Safety and Health Administration standards, the maximum permissible exposure limit is an eight-hour, time-weighted average of 0.1 fibre per cubic centimetre of air. Any amount above this limit signifies asbestos contamination.

The filtered wastewater collected from the ground-washing activities and showers taken at the decontamination facility was analyzed for asbestos fibres using scanning electron microscopy in accordance with NEN-ISO 14966.

The control limit, under the Control of Asbestos Regulations, is the concentration of asbestos in the atmosphere which is 0.1 fibres per cubic centimeter of air averaged over a continuous period of 4 hours. Furthermore, under UK's Technical Guidance WM3 on the classification and assessment of waste and as per The Control of Asbestos Regulations 2012 (UK Instrument 2012 No. 632) Part 1, if waste contains fibres that are free and dispersed then the waste will be hazardous given the material as a whole contains 0.1% or more asbestos by dry weight. These thresholds will be upheld as the main investigation criterion to identify asbestos contamination.

In addition to testing for asbestos, the samples were analyzed for lead leachability. Details on the leachability test are provided in section 3.5.

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Methodology and Approach

1. Understanding Site Operations
2. Sampling Program
3. Health and Safety Measures

2. Methodology and Approach

2.1. Understanding Site Operations

Asbestos-containing material (ACM) has been confirmed to be present on-site. Thus, before an appropriate sampling program can be defined, it is critical to first understand the site operations process, from the time debris is removed from the stockpile to the time it is crushed into fine rubble for later reuse.

To fully understand this process, IBI Group reviewed the heavy machinery on the ground with aid from Development Inc. This enabled the project team to better understand the mechanics behind each step to ensure the samples would be representative of overall site operations.

The first step in the rubble-crushing operation is to transfer a predetermined amount of stockpile material onto a screener for segregation. Once the stockpile material is transferred to the top level of the inclined screen, and while continuously being wetted, the screen performs its duty and separates the pieces of material by size: fine (less than 80 mm in diameter), medium (80 mm to 130 mm) and bulky (greater than 130 mm). The fine material sieves through the different levels of the screen and moves toward the bottom. From there, it is transferred to the sorted and crushed rubble stockpile. Medium and bulky materials are visually investigated for further segregation into three categories of material: concrete, ACM, and other (e.g., plastics, metals, glass, general waste). After segregation, the bulky concrete is transferred to the crushing machine and then transferred to the sorted/crushed rubble stockpile.

To provide value-added service during its examination of the medium and bulky materials, and to improve the quality of the material, the IBI Group team visually inspected each segregated stockpile for the presence of friable and non-friable ACM. The following are examples of ACM that had the potential to be encountered during this exercise. All of these are commonly used in building materials:

- Friable:
  - sprayed insulation
  - acoustic/textured plaster
  - mechanical insulation
  - plaster

- Non-friable:
  - » asbestos cement products
  - » acoustic ceiling tiles
  - » vinyl floor tiles and vinyl sheet flooring
  - » drywall joint compound
  - » plaster

Extensive asbestos surveys have not been previously completed in Lebanon and, as such, the types of ACM that are common to the country are poorly understood. However, based on the few local surveys that have been conducted by IBI Group in Beirut within the past few years, it is unlikely that potential asbestos in building materials consists of friable material except for piping networks. Refer to Appendix B for a communique that describes the types of ACM that may be encountered in Lebanon along with some safety measures to follow if ACM is encountered and/or disturbed.

All materials presumed to contain asbestos underwent the disposal preparation procedures defined in IBI Group's *Guidelines for Managing Asbestos at the Bakalian Disposal Site*. Other materials (e.g., plastics, metals, glass, general waste) were transferred to a wading pool filled with amended[1] water for decontamination and secondary segregation in the clean zone. Sought-after material (e.g., material that can be resold) was then removed and placed aside for off-site transfer. All other remaining material (e.g., general waste) was then scheduled for transport to a landfill. After all materials were removed, the wastewater in the wading pool and collected from the decontamination facility showers was pumped into a tank and run through a filtration unit that removes fibres and debris.

2.2. Sampling Program

The aim of the sampling program is to assess whether the health and safety measures implemented on-site (as per IBI Group's guidelines) are protecting both workers and the environment from any asbestos fibres dispersed as a result of crushing operations.

To support this assessment, IBI Group gathered air and wastewater samples during rubble-crushing operations. In addition, to supplement our understanding, bulk samples were collected during each stage of the crushing process. To learn more about their original composition, baseline samples were collected from newly arrived stockpile materials.

1. Water to which a surfactant has been added to decrease the surface tension.

Bakalian Waste Storage Site / UN-Habitat © 2021

Manipulation of Mixed 2 Stockpile

Glass Stockpile

Mixed 1 Stockpile

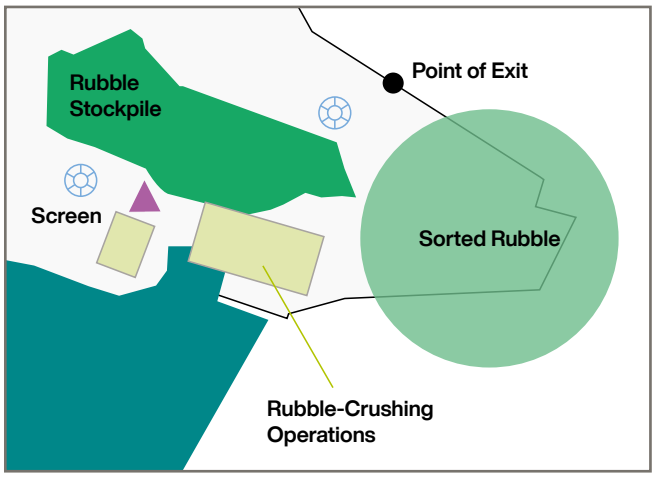
A chain-of-custody form was completed for all of the air, wastewater, bulk, and baseline samples collected on-site. The air, bulk, and baseline samples were then couriered to EMSL Canada Inc., an environmental molecular sciences laboratory located in Mississauga, Canada.
The wastewater sample that was collected on-site was couriered to EAG Laboratories in Eindhoven, The Netherlands.

2.2.1. AIR SAMPLING

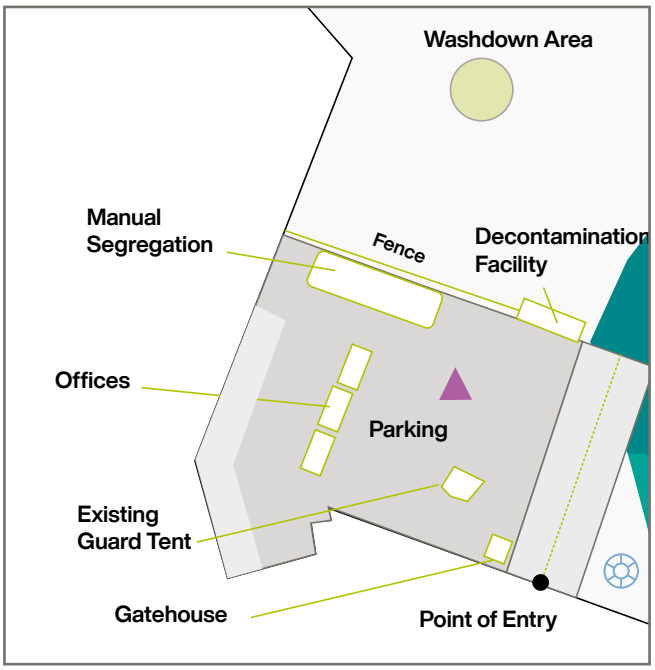
Daily outdoor air sampling was conducted to test for the concentration of airborne asbestos in and around strategic site locations. For this small-scale trial, two locations were identified as areas of importance for the air quality investigation: the rubble-crushing operations and the clean zone. The air sample locations are highlighted with purple triangle symbols in the figures below.

Figure 3. Two Locations of Importance for the Air Quality Investigation

RUBBLE-CRUSHING OPERATIONS



CLEAN ZONE



A pre-calibrated pump, the Osiris environmental particle monitor device, was used to draw in a steady amount of air through a filter that collects airborne fibres. The pump was calibrated to between 3 L/min and 4 L/min and ran for most of the day (six to eight hours) to capture a minimum of 1,400 litres of air for analysis. All samples were sent to an accredited laboratory and analyzed for asbestos fibres using scanning electron microscopy.

2.2.2. WASTEWATER SAMPLING

As stated earlier, the filtered wastewater gathered from both the wading pool and the decontamination facility was stored in a tank for subsequent collection and analysis of asbestos content. The polyethylene siphon pump used to draw the required one litre of wastewater from the tank was dedicated to this site alone, to minimize the possibility of cross-contamination. The collection medium was a single-use container of suitable material and appropriate for the analysis being conducted. The sample and container were then shipped to an accredited laboratory and analyzed for asbestos in water in conformance with NEN-ISO 14966.

2.2.3. BULK SAMPLING

A standardized approach, one that draws on the EPA procedures for dealing with debris created from natural disasters, was employed to characterize the site debris during the sampling task. Based on the volume of materials present on-site, the team determined it needed to collect a total of 20 debris/dust samples for analysis. The level of asbestos content in these samples was determined using polarized light microscopy (EPA test method 600/R 93/116: Method for the Determination of Asbestos in Bulk Building Material) with gravimetric reduction. If required, it was further tested using ASTM D5755: Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading. Prior to laboratory analysis, each sample was milled to achieve homogenization.

To calculate the number of samples required, which is based on the estimated volume of the stockpile, the IBI Group team followed EPA procedures as well as information on industry best practices obtained through communications with sample-testing laboratories and officials from the Ontario Ministry of the Environment, Conservation, and Parks. This approach mimics the standards prescribed in Ontario Regulation 153/04 on the completion of a record of site condition (e.g., for reused soil that will serve as fill) and the standard for performing TCLP procedures.

The regulation states that if the stockpile volume (V) is greater than 5,000 m^3, then the minimum number of samples (N) that must be collected and analyzed is to be calculated as follows:

$$N = 32 + (V - 5{,}000) \div 300$$

Incorporating the total estimated volume of the stockpile into the formula produces a total of 50 samples. However, for TCLP procedures for CDW streams, 40% of the N value is considered sufficient for obtaining a representative number of samples. Thus, a minimum of 20 samples had to be captured for analysis. In addition, each stockpile underwent a lead-specific TCLP analysis to understand the material's leachability with respect to lead.

Because the samples had to be collected from strategic operational locations, every attempt was made to minimize disturbance. IBI Group used the following procedures to collect samples:

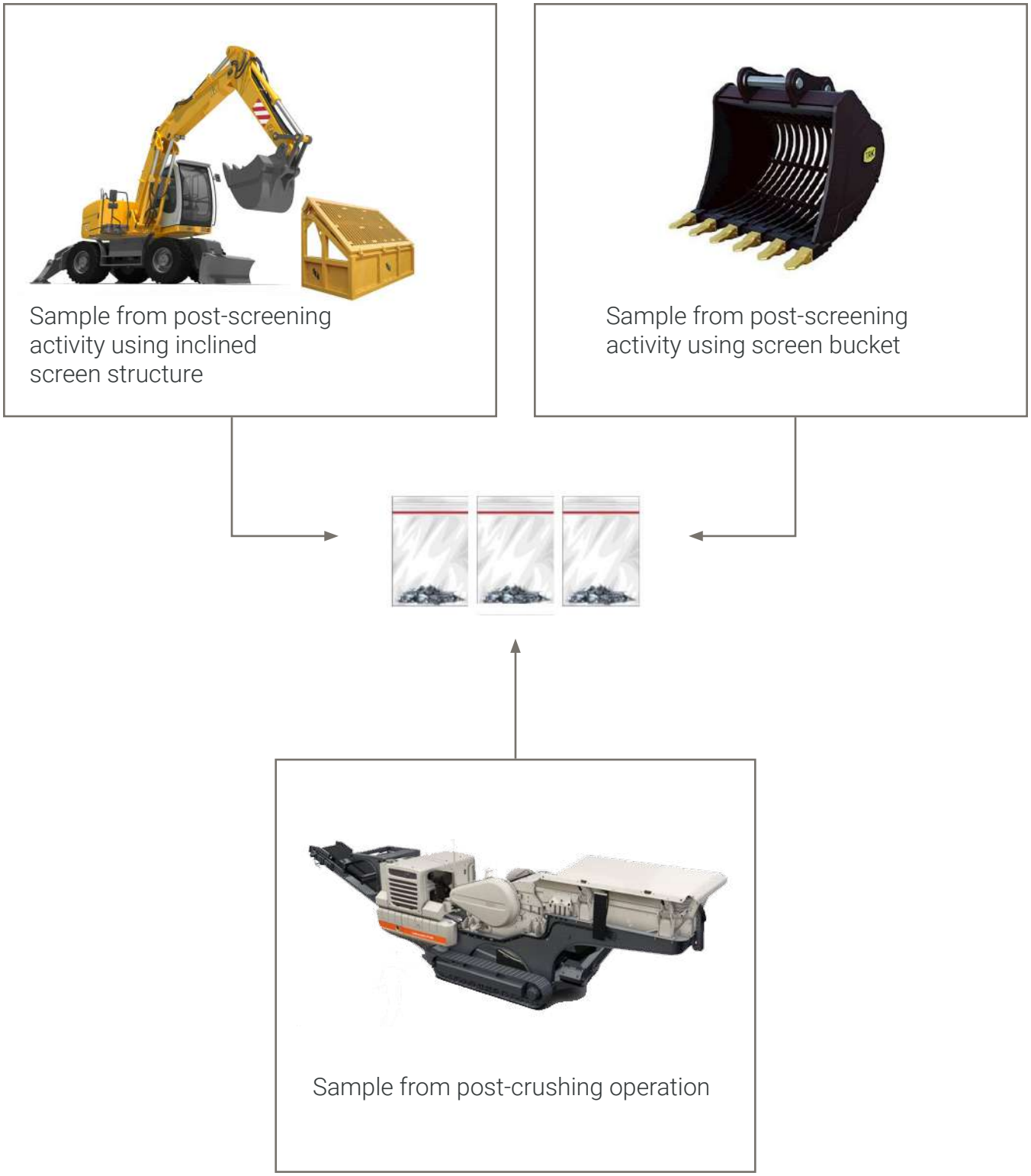
- For bulk materials, a sample was obtained using one of two methods:
  - » The sampling device was slowly pushed into the material with a twisting motion until the entire thickness was penetrated and then the device was extracted, or
  - » A knife (or similar tool) was cleaned and then used to excise a piece of the material.
- Prior to sample collection, the surface of the material was wetted with amended water using a spray bottle. In situations where the material could not be wetted, a plastic bag or other containment was put around the sampling device.
- Each sample was placed in a clear plastic bag with a tight closure, labelled appropriately, and placed in a second, similar bag. Debris was cleaned up using wet paper towels and discarded into a plastic bag.

Table 1 and Figure 4 show the sample points and the number of samples, respectively, required for each type of stockpile material for this small-scale trial.

Table 1. Sample of Different Types of Materials

STOCKPILE	LOCATION OR TIMING OF FINE MATERIAL CAPTURE	NUMBER OF SAMPLE(S)
Rubble Stockpile	From bottom of screen	3
	Following crushing operations	3
Mixed 1 Stockpile	From bottom of screen	5
	Following crushing operations	5
Mixed 2 Stockpile	From bottom of screen	2
	Following crushing operations	2

Figure 4. Bulk Sampling Method



2.2.4. TCLP AND BASELINE SAMPLING

Lastly, and as another value-added service, IBI Group sampled some of the newly arrived materials disposed of between January and August 2021. One sample from each of the three stockpiles was collected. The analysis procedures were similar to those used for the original bulk samples. In addition, the three samples were analyzed to determine if they exhibited the characteristics of leachable toxic waste specific to lead.

2.3. Health and Safety Measures

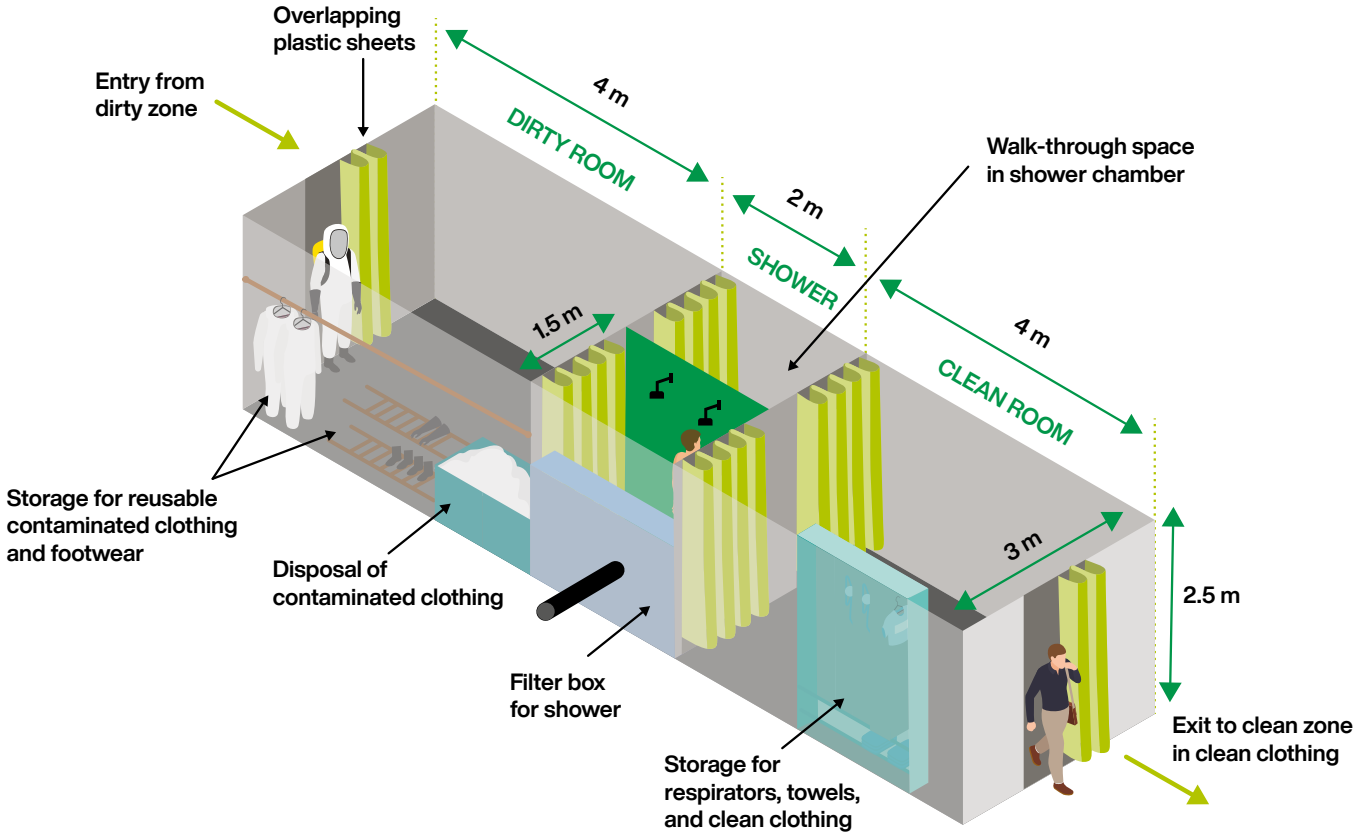
Asbestos is a significant environmental hazard that has widespread implications on public and community health. Its detrimental effects and carcinogenic properties have been widely documented. It has been shown to trigger asbestosis and cancers, including malignant mesothelioma and cancers of the lung, larynx, and ovary.

Whether the asbestos originates from production, construction, or demolition sites, or from areas where it occurs naturally, exposure is usually through the inhalation of airborne fibres, although they can also be ingested. In addition to occupational exposure, these fibres can contaminate the air in residential settings, causing neighbourhood exposure as well as broader air pollution. However, asbestos contamination is not restricted to the air. The demolition and poor disposal of building materials can also contaminate soil and water resources. Therefore, the risks of environmental contamination associated with this must be appropriately assessed and mitigated; however, evaluating the full risk is a significant challenge because asbestos has a long latency period.

If intact (undisturbed) building materials within a structure are suspected of containing asbestos, it is recommended that the material not be disturbed until the presence of asbestos can be properly identified. In the case of the stockpiles investigated at the Bakalian site, the process of sampling was expected to cause an excessive amount of disturbance; therefore, IBI Group implemented proper precautions to minimize potential exposure and cross-contamination. A detailed explanation of these health and safety measures can be found in IBI Group's *Guidelines for Managing Asbestos at the Bakalian Disposal Site*.

Sample Health and Safety Measures from IBI Group's Guidelines for Managing Asbestos at the Bakalian Disposal Site

Possible Decontamination Facility Layout



Examples of signs in the work area

3

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Observations and Results

1. Air Samples
2. Wastewater Sample
3. Bulk Samples
4. Baseline Samples
5. Toxicity Characteristic Leaching Procedure Samples
6. Disposal of Asbestos Waste

3. Observations and Results

A total of 11 air samples, one wastewater sample, 20 bulk (material) samples, three baseline samples, and three TCLP samples were collected were collected at the Bakalian waste storage site.

Samples were taken from operations involving the rubble, mixed 1, and mixed 2 stockpiles. The glass stockpile was not part of this investigation, as the glass-crushing equipment had not yet been installed at the time IBI Group visited the site. The equipment is scheduled to be installed in mid-November 2021, at which time the IBI Group field team will revisit the site and conduct another round of sampling specific to the glass-crushing operations.

The laboratory-issued certificates of the analysis results are provided in **Appendix A**.

3.1. Air Samples

Osiris Environmental Particle Monitor Device / Bakalian Waste Storage Site /
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Air samples were collected using a constant-flow, high-volume air-sampling pump. Before sampling was conducted, the equipment was calibrated to a flow rate of 3 L/min to 4 L/min using a standard electronic bubble meter. Samples were collected using a mixed cellulose ester membrane filter with a pore size of 0.8 micrometres and a diameter of 25 mm. The filter was mounted inside a three-piece filter cassette with a two-inch cowl.

A total of 11 air samples were collected and submitted to EMSL for analysis. An asbestos fibre analysis was performed using transmission electron microscopy (TEM), as specified in the *US Code of Federal Regulations*, Chapter 40, Part 573, Appendix A to Subpart E. This method of analysis is approved by the EPA for confirming low-level concentrations of asbestos in non-friable organically bound materials and in some friable building materials. Using this method, EMSL is able to attain a sensitivity level of 0.0042 structures per cubic centimetre.

To assess the concentration of airborne fibres for the purpose of this small-scale sampling program, a minimum concentration of 0.1 fibres per cubic centimetre was deemed an appropriate standard for the interpretation of analytical results. (The laboratory report uses the term “structures per cubic centimetre” rather than the more common “fibres per cubic centimetre” to differentiate that a TEM analysis can detect fibrous structures that cannot be seen using less-sensitive methods, such as phase contrast microscopy.)

Air monitoring was conducted daily at the Bakalian waste disposal site within the clean and dirty zones defined in Table 2. The results are listed below.

Table 2. Results of TEM Analysis of Air Samples for Asbestos Fibres

Date Sampled (2021)	Identifier	Location	Volume of Air (L)	Result (f/cc)	Pass/ Fail
August 23	AIR-01	Clean zone	1,440	< 0.0042	Pass
August 23	AIR-02	Dirty zone during screening activities	1,440	< 0.0042	Pass
August 24	AIR-03	Clean zone	1,440	< 0.0042	Pass
August 24	AIR-04	Dirty zone during screening activities	1,440	< 0.0042	Pass
August 25	AIR-05	Clean zone	1,440	< 0.0042	Pass
August 25	AIR-06	Dirty zone during screening activities	1,440	< 0.0042	Pass
August 25	AIR-06A		1,440	< 0.0042	Pass
August 26	AIR-07	Clean zone	1,440	< 0.0042	Pass
August 26	AIR-08	Dirty zone during screening activities	1,440	< 0.0042	Pass
August 27	AIR-09	Clean zone	1,440	< 0.0042	Pass
August 27	AIR-10	Dirty zone during screening activities	1,440	< 0.0042	Pass

f/cc = fibres per cubic centimetre; L = litres; TEM = transmission electron microscopy.

As mentioned earlier, the maximum exposure limit (per the US Occupational Safety and Health Administration) is 0.1 fibre per cubic centimetre of air. Thus, the results in Table 2 show that the concentrations of airborne asbestos fibres in the 11 samples collected were within acceptable limits.

3.2. Wastewater Sample

Filtered wastewater—generated by showering within the decontamination facility, the washing of non-asbestos materials for reuse purposes, and the washing down of vehicles as they exited the Bakalian waste disposal site—was gathered, sampled, and submitted for analysis of asbestos content. This analysis was done in compliance with NEN-ISO 14966 using scanning electron microscopy. The results are shown Table 3.

Table 3. Results of Analysis of Wastewater Sample for Concentration of Asbestos

Identifier	Type of Asbestos (m/m %)			
	Chrysotile	Amosite	Crocidolite	Other[1]
WS-1	0% or < 0.1%[2]	0 or < 0.1%[2]	0 or < 0.1%[2]	0 or < 0.1%[2]

m/m % = mass percent concentration of a solution.

1. Tremolite, actinolite, or anthophyllite.
2. No asbestos was found or the concentration by weight was less than 0.1%.

3.3. Bulk Samples

The bulk samples were analyzed by EMSL Canada. EMSL is an independent commercial laboratory accredited under the US National Voluntary Laboratory Accreditation Program to ensure consistent, accurate, and defensible results. EMSL analyzed the collected samples following the methods prescribed by two authorities:

- O.Reg 278/05, *Designated Substance – Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations, and*
- EPA Test Method EPA/600/R-93/116: *Method for the Determination of Asbestos in Bulk Building Materials (June 1993)*

The analysis was done using polarized light microscopy (PLM); if necessary, a subsequent analysis using a 1,000-point count gravimetric reduction was also carried out. Prior to laboratory analysis, each of the bulk samples underwent milling to achieve homogenization.

The bulk samples that were collected as part of this small-scale trial were taken from the rubble, mixed 1, and mixed 2 stockpiles. They were collected at various stages of the crushing process, submitted for analysis separately, and coded differently. Therefore, the results are reported and presented independently.

In line with O.Reg. 278/05 and Chapter S-2.1, r.13 (Quebec regulation respecting occupational health and safety) and for the purpose of this trial, if a sample collected from one stage of the crushing process had an asbestos concentration of 0.1% or greater, all stages of the process were assumed to contain asbestos.

3.3.1. RUBBLE STOCKPILE

The rubble stockpile is situated in the northernmost part of the Bakalian waste disposal site. It has a total volume of approximately 2,963 m^3. A visual assessment found the stockpile to be made up of approximately 95% concrete rubble material and 5% comingled materials, such as metals and other general household waste.

The field team collected six samples from the rubble stockpile and submitted them for analysis of asbestos content. Using PLM analysis, none of the samples were found to contain asbestos, thus necessitating further analysis using a 1,000-point count gravimetric reduction. **That analysis further confirmed that none of the six samples contained asbestos**.

Table 4 summarizes the results of the analysis of the rubble stockpile samples that were collected at each step of the crushing process.

Table 4. Results of Analysis of Bulk Samples from the Rubble Stockpile

Date Sampled (2021)	Identifier	Sample Location and Activity	Results (Asbestos Present or Absent)[1]	
			PLM	TEM
BULK SAMPLES COLLECTED FROM RUBBLE STOCKPILE				
August 25	BLK-06-S2-B	Collected from tumbling activities using a screened excavator bucket	Absent	Absent
August 25	BLK-08-S1-B		Absent	< 0.1%
August 25	BLK-07-S1-B	Collected from inclined screen	Absent	Absent
August 25	BLK-06-C1-B-Texture	Collected following crushing operations (associated with stockpile material from inclined screen)	Absent	Absent
August 25	BLK-07-C1-B		Absent	Absent
August 25	BLK-08-C2-B	Collected following crushing operations (associated with stockpile material from tumbling activities using a screened excavator bucket)	Absent	Absent

PLM = polarized light microscopy; TEM = transmission electron microscopy.

1. Asbestos comprises six unique minerals (types): chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. Chrysotile, also known as white asbestos, is the most common, accounting for nearly 95% of the asbestos in products.

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Decontamination Facility

Entry Zone to Bakalian Waste Disposal Site

3.3.2. MIXED 1 STOCKPILE

The mixed 1 stockpile is centrally located at the Bakalian waste disposal site and has a volume of approximately 14,025 m^3. A visual assessment of the stockpile found that it consists of an even distribution of comingled materials, such as concrete rubble, plastics, and general household waste.

The field team collected a total of 10 samples from the mixed 1 stockpile and submitted them for analysis of asbestos content. Using PLM analysis, none of the samples were found to contain asbestos, thus necessitating further analysis using a 1,000-point count gravimetric reduction. **That analysis further confirmed that none of the ten samples contained asbestos.**

Table 5 summarizes the results of the analysis of the mixed 1 stockpile samples that were collected at each step of the crushing process.

Table 5. Results of Analysis of Bulk Samples from the Mixed 1 Stockpile

Date Sample (2021)	Identifier	Sample Location and Activity	Results (Asbestos Present or Absent)[1]	
			PLM	TEM
BULK SAMPLES COLLECTED FROM MIXED 1 STOCKPILE				
August 24	BLK-01-S1-A	Collected from inclined screen	Absent	< 0.1%
August 24	BLK-02-S1-A		Absent	Absent
August 24	BLK-03-S1-A		Absent	Absent
August 24	BLK-04-S2-A	Collected from tumbling activities using a screened excavator bucket	Absent	Absent
August 24	BLK-05-S2-A		Absent	Absent
August 25	BLK-01-C1-A	Collected following crushing operations (associated with stockpile material from inclined screen)	Absent	< 0.1%
August 25	BLK-02-C1-A		Absent	< 0.1%
August 25	BLK-03-C1-A		Absent	Absent
August 25	BLK-04-C2-A	Mixed 1 stockpile bulk sample collected following crushing operations activities (associated with stockpile material from tumbling activities using a screened excavator bucket)	Absent	< 0.1%
August 25	BLK-05-C2-A		Absent	< 0.1%

PLM = polarized light microscopy; TEM = transmission electron microscopy.

1. Asbestos comprises six unique minerals (types): chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. Chrysotile, also known as white asbestos, is the most common, accounting for nearly 95% of the asbestos in products.

3.3.3. MIXED 2 STOCKPILE

The mixed 2 stockpile is situated at the southernmost part of the Bakalian waste disposal site (immediately east of the entrance to the site) and has a volume of approximately 7,333 m^3. A visual assessment of the stockpile found it consists of an even distribution of comingled materials that include concrete rubble, plastics, and general household waste.

The field team collected four samples from the mixed 2 stockpile and submitted them for analysis of asbestos content. Using PLM analysis, only one of the samples was found to contain asbestos. Therefore, a second analysis of the remaining three samples was performed using gravimetric reduction with a 1,000-point count. That analysis found that **none of the three samples contained asbestos**.

Table 6 summarizes the results of the analysis of the mixed 2 stockpile samples that were collected at each step of the crushing process.

Table 6. Results of Analysis of Bulk Samples from the Mixed 2 Stockpile

Date Sample (2021)	Identifier	Sample Location and Activity	Results (Asbestos[1] Present or Absent)	
			PLM	TEM
BULK SAMPLES COLLECTED FROM MIXED 2 STOCKPILE				
August 25	BLK-09-S1-C	Collected from inclined screen	Present[2]	
August 25	BLK-10-S2-C	Collected from tumbling activities using a screened excavator bucket	Absent	< 0.1%
August 26	BLK-09-C1-C	Collected following crushing operations activities (associated with stockpile material from inclined screen)	Absent	< 0.1%
August 26	BLK-10-C2-C	Collected following crushing operations activities (associated with stockpile material from tumbling activities using a screened excavator bucket)	Absent	< 0.1%

PLM = polarized light microscopy; TEM = transmission electron microscopy.

1. Asbestos refers to six unique minerals (types): chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. Chrysotile, commonly known as white asbestos, is the most common, accounting for nearly 95% of the asbestos found in products.
2. Following PLM analysis, sample BLK-09-S1-C was found to contain < 0.25% chrysotile. Normally, no concentration percentage is provided for asbestos results, only a finding of presence or absence; however, the 0.25% level of concentration is provided here because it exceeds the threshold of 0.1% asbestos content by dry weight. Because asbestos was present, no further analysis of this sample was required.

3.4. Baseline Samples

The baseline samples collected were analyzed following the methods prescribed by two authorities:

- O.Reg 278/05, *Designated Substance – Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations, and*
- EPA Test Method EPA/600/R-93/116: *Method for the Determination of Asbestos in Bulk Building Materials (June 1993)*

The analysis was done using polarized light microscopy (PLM); if necessary, a subsequent analysis using a 1,000-point count gravimetric reduction was also carried out. Prior to laboratory analysis, each of the baseline samples underwent milling to achieve homogenization.

The field team collected six samples, two samples per stockpile, and submitted them for analysis of asbestos content. Using PLM analysis, only one of the samples was found to contain asbestos. Therefore, a second analysis of the remaining five samples was performed using gravimetric reduction with a 1,000-point count. That analysis found that none of the five samples contained asbestos.

Table 7 summarizes the results of the analysis of the baseline samples that were collected for each of the stockpiles.

Table 7. Results of Analysis of Baseline Samples

Date Sample (2021)	Identifier	Sample Location and Activity	Results (Asbestos[1] Present or Absent)	
			PLM	TEM
BULK SAMPLES COLLECTED FROM RUBBLE STOCKPILE				
August 23	BL-S-01-A	Baseline samples	Present[2]	
August 24	BL-T-01-A		Absent	< 0.1%
August 23	BL-S-02-B	Baseline samples	Absent	< 0.1%
August 24	BL-T-02-B		Absent	< 0.1%
August 23	BL-S-03-C	Baseline samples	Absent	< 0.1%
August 24	BL-T-03-C		Absent	< 0.1%

PLM = polarized light microscopy; TEM = transmission electron microscopy.

1. Asbestos refers to six unique minerals (types): chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. Chrysotile, commonly known as white asbestos, is the most common, accounting for nearly 95% of the asbestos found in products.
2. Following PLM analysis, sample BL-S-01-A was found to contain 0.50% chrysotile. Normally, no concentration percentage is provided for asbestos results, only a finding of presence or absence; however, the 0.50% level of concentration is provided here because it exceeds the threshold

3.5. Toxicity Characteristic Leaching Procedure Samples

One TCLP sample per stockpile was collected and submitted for analysis to determine if it exhibited the characteristics of leachable toxic waste specific to lead.

The materials sampled were analyzed in accordance with O.Reg 558 Schedule 4 using TCLP Test Method 1311: Toxicity Characteristic Leaching Procedure, which is outlined in EPA publication *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. The Schedule 4 limit for the concentration of lead in leachate is 5 mg/L; results that exceed this limit are considered to be hazardous waste.

Each of the three samples weighed approximately 100 grams, as required for the TCLP analysis. The sample material was collected onto large sheets of paper and then transferred to a pre-labelled sample bag.

Table 8. Results of Analysis of TCLP Samples for Lead Content

Parameter	Reporting Limit[1]		Sample Identifier and Results		
			TCLP-A	TCLP-B	TCLP-C
Lead	mg/L	5.0	< 0.40 mg/L	< 0.40 mg/L	0.41 mg/L

TCLP = toxicity characteristic leaching procedure wastewater sample.

1. Lowest concentration the laboratory can report with certainty.

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Interior of Decontamination Facility

Rubble-Crushing Operations

Rubble-Sorting Area

3.6. Disposal of Asbestos Waste

Presumed asbestos-containing paper mechanical insulation

Presumed asbestos-containing plaster application

Presumed asbestos-containing cement products

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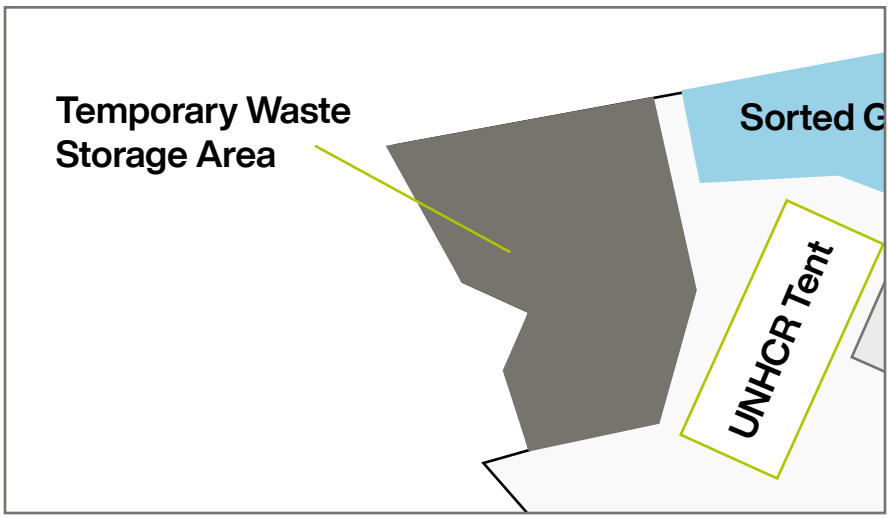
ACM was identified through visual examinations conducted at various stages of site operations. When such materials were found, they were extracted and disposed of following proper procedures, which are outlined in IBI Group's *Guidelines for Managing Asbestos at the Bakalian Disposal Site*. As explained in that document, disposable personal protective equipment such as coveralls must also be disposed of as asbestos-contaminated waste.

The temporary waste storage area where ACM at the Bakalian disposal site will be stored (until the off-site quarry is rehabilitated to permanently receive this type of hazard) was not constructed in time for this small-scale trial. As a result, all ACM that was captured on-site was stored appropriately and relocated to one of the fixed on-site structures where it awaits construction of the temporary waste storage area.



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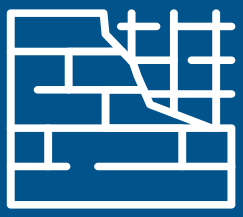
On-Site Fixed Structure, Bakalian Waste Storage Site / UN-Habitat © 2021

4

Original Image: Ecology / Adobe Stock

Recommendations for the Long-Term Management of the Bakalian Waste Disposal Site



1. Recommended Modifcations to Sampling Program
2. Recommended Modifications to Operations
3. Administrative Recommendations

4. Recommendations for the Long-Term Management of the Bakalian Waste Disposal Site

The laboratory results for both the air and wastewater samples strongly suggest the health and safety measures implemented at the site are functioning as intended and are protecting both workers and the local environment. However, even though these results are favourable for the purpose of this small-scale trial, there will always be additional mechanisms that could be installed to further improve site operations as well as the long-term management plan.

Below are a set of recommended modifications, including upgrades to the sampling program and operations and administration processes, that will help achieve this goal.

4.1. Recommended Modifications to Sampling Program

The overall approach used for the bulk sampling that was conducted during the small-scale trial was the correct method; however, it is strongly recommended that the number of samples collected per stage of the crushing operation be increased beyond the minimum specified in the guideline document. In addition, the following revisions to the sampling program should be considered for better long-term management of the site:

1. The parameters for TCLP samples collected for analysis of lead content should be extended to include both organic and inorganic analytes to determine the presence of metals, pesticides, herbicides, semi-volatiles, and volatiles.
2. The air samples collected within the site were found to be clean. However, it is recommended that air samples be collected outside the boundary of the Bakalian waste disposal site to enable assessment of the air quality in an area beyond site operations. The location of this external collection point must be selected strategically to ensure it is representative of different functional spaces (e.g., residential, manufacturing, commercial). The figure below shows the areas that should be investigated (shaded in blue), as these areas represent different functional uses within the area surrounding the Bakalian waste disposal site.

Figure 5. Areas for Air Sampling Outside of the Bakalian Waste Disposal Site
Original Image: Imagery © 2021 CNES / Airbus, Maxar Technologies, Map Data © 2021

4.2. Recommended Modifications to Operations

The laboratory results for the mixed 2 stockpile identified the presence of asbestos following IBI Group's sampling of the screened fine material (material that is less than 80 mm in diameter). This finding was anticipated, and plans are in place, **for all stockpiles**, to contain and store this material on-site as hazardous material until off-site transfer can be scheduled.

However, for CDW generated from the Port of Beirut explosion (or from any other unforeseen event), all efforts should be made to improve the quality of this material, as this can reduce the level of hazard. For example, with the exception of sample BLK-09-S1-C, while the laboratory results showed that chrysotile asbestos was present in the samples of the crushed material from the mixed 1 and mixed 2 stockpiles, the level of asbestos was well below the threshold of 0.1%, indicating the field team's screening efforts did improve the quality of the crushed material to the best extent possible.

With that in mind, the following modifications to oversight procedures are to be implemented when working on all stockpiles to further improve the quality of the crushed material:

1. Reduce the number of excavator buckets by 30% per screening stage, whether using an inclined screen or a screened excavator bucket. This will allow for a more manageable volume of material so that it can continue to be scanned visually.
2. Provide comprehensive training to the contractor's entire field team on how to identify materials historically known to contain ACM. In addition to training contractors on the ground (to increase the number of people in the field who are able to identify ACM), we should also consider adding consultancy staff to further improve ACM capture.

By implementing these two measures, the ability of the field team to identify and remove ACM prior to crushing will further improve the quality of the crushed material. Ultimately, this will lessen the hazard associated with transferring and handling this material in the quarry and support better long-term management of the site.

Furthermore, the results for the baseline samples show that the new volumes entering the site for disposal are relatively clean in comparison to the initial stockpile volumes. This could mean one of two things: firstly, that as a result of the truckload inspections conducted by the (Development Inc.) site management team, the ground team is carrying out its task to put a halt to the improper disposal of hazardous materials at the site, or secondly, that during the relevant six-month period (between January and August 2021), ACM constituted a lower percentage of the overall construction and demolition debris. A further investigation is required to ensure the screening process is in fact effective and successful.

4.3. Administrative Recommendations

As ACM is present on-site, it is vital that on-site operations continue to comply with IBI Group's *Guidelines for Managing Asbestos at the Bakalian Disposal Site*. Furthermore, these guidelines should be revised and updated to ensure they are fully aligned with the finding and recommendations of this report. This will help ensure the goals for the long-term management of asbestos at the Bakalian waste disposal site are met.

To ensure good compliance, the following should be developed specifically for the site: asbestos awareness training, written practices for managing asbestos within specific operations at the site, standard forms, and provisions for inspections and air monitoring. Management solutions, in addition to administrative recommendations, should also considered.

Currently, no local treatment options or disposal facilities for this type of hazardous waste exist in Lebanon. It is therefore critical that the rehabilitation of the quarry (as a disposal site for ACM waste) not be delayed. This rehabilitation should be performed in parallel with the long-term management of the Bakalian waste disposal site.

When disposal takes place off-site, the method and means of transportation need to be carefully considered to avoid mismanagement of this hazardous waste. For example, buried asbestos still needs to be properly managed in accordance with procedural guidelines and regulations similar to Reg. 347: *General – Waste Management* (*Environmental Protection Act*, R.S.O. 1990, chapter E. 19), Section 17 – Management of Asbestos Waste.

In general, the regulations for asbestos-contaminated CDW caused by unforeseen events (like the Port of Beirut explosion) are less stringent compared with regulations for waste generated due to contractor malpractice (e.g., failing to remove ACM prior to the demolition of a structure).

Currently, no mandatory laws exist in Lebanon requiring owners to conduct an asbestos survey of a structure prior to a renovation or planned demolition. There are also no regulations on the removal and disposal procedures that need to be followed if ACM is identified. In the absence of such laws, all CDW generated from renovation and/or planned demolition that enters the Bakalian waste disposal site must be presumed to contain asbestos and treated and disposed of accordingly.

To avoid overusing the rehabilitated quarry where asbestos-containing waste will be disposed of permanently, ACM needs to be removed from structures **before** any renovation or planned demolition. This can be achieved by making this a required condition for obtaining a renovation and/or demolition permit.

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5

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Limitations of this Report

5. Limitations of this Report

The observations, results, and conclusions drawn by IBI Group are limited to the specific scope of work for which IBI Group was retained and are based solely on information generated as a result of the specific scope of work authorized by UN-Habitat. Only those items that are capable of being observed and are reasonably obvious to IBI Group personnel, or that have been identified to IBI Group by other parties, can be reported. During the execution of this assessment, IBI Group has exercised a degree of thoroughness and competence that is consistent with the profession. IBI Group considers the opinions and information presented in this report to be factual at the time of the assessment. The conclusions are limited to the specific locations where testing and/or observations were conducted during the assessment.

It is important to note that all work was completed with the utmost care and based on our extensive expertise in carrying out assessments. IBI Group believes the information collected during the assessment of the Bakalian waste disposal site is reliable. No other warranties are implied or expressed. IBI Group, to the best of its knowledge, believes this report to be accurate; however, IBI Group cannot guarantee the completeness or accuracy of information supplied to IBI Group by third parties.

Bakalian Waste Storage Site / UN-Habitat © 2021

Appendix A
Laboratory Certificates of Analysis

Original Image: Vincent Prevost / Adobe Stock

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Tel/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order: 552114524
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attention: Hassan Ktaech
IBI Group
70 Valleywood Drive
Markham, ON L3R 4T5

Project: 135455

Phone: (905) 940-6161
Fax:
Received Date: 09/01/2021 19:00 PM
Analysis Date: 09/09/2021
Collected Date:

Test Report: Asbestos Fiber Analysis by Transmission Electron Microscopy (TEM) Performed by EPA 40 CFR Part 763 Appendix A to Subpart E

Sample	Location	Volume (Liters)	Area Analyzed (mm²)	Non Asb	Asbestos Type(s)	#Structures ≥0.5µ < 5µ	#Structures ≥5µ	Analytical Sensitivity (S/cc)	Asbestos Concentration (S/mm²)	Asbestos Concentration (S/cc)
AIR-01	Air sample from clean zone (Baseline)	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0001 *										
AIR-02	Air samples from dirty zone (Baseline)	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0002 *										
AIR-03	Air sample from clean zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0003 *										
AIR-04	Air samples from dirty zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0004 *										
AIR-05	Air sample from clean zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0005 *										
AIR-06	Air samples from dirty zone (before crushing)	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0006 *										
AIR-06 A	Air samples from dirty zone (during crushing)	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0007 *										
AIR-07	Air sample from clean zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0008 *										
AIR-08	Air samples from dirty zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0009 *										
AIR-09	Air sample from clean zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0010 *										
AIR-10	Air samples from dirty zone	1440.00	0.0640	0	None Detected	0	0	0.0042	<16.00	<0.0042
552114524-0011 *										

* 0.8 µm filter used

Initial report from: 09/09/2021 17:09 PM

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Tel/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order: 552114524
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attention: Hassan Ktaech
IBI Group
70 Valleywood Drive
Markham, ON L3R 4T5

Project: 135455

Phone: (905) 940-6161
Fax:
Received Date: 09/01/2021 19:00 PM
Analysis Date: 09/09/2021
Collected Date:

Test Report: Asbestos Fiber Analysis by Transmission Electron Microscopy (TEM) Performed by EPA 40 CFR Part 763 Appendix A to Subpart E

Sample	Location	Volume (Liters)	Area Analyzed (mm^2)	Non Asb	Asbestos Type(s)	#Structures ≥0.5μ < 5μ	#Structures ≥5μ	Analytical Sensitivity (S/cc)	Asbestos Concentration (S/mm^2)	Asbestos Concentration (S/cc)

Analyst(s)

Anne Balayboa (11)

Matthew Davis or other approved signatory

Initial report from: 09/09/2021 17:09 PM

ELARD - Lebanon
Att. Georges Nasr
Hojeily Center 6th Fl., Pere Yaoub Stree
2708 5803 Sin El Fil
LEBANON

Certificate of analysis

Date: 15-Sep-2021

Please find enclosed the analytical results of the test carried out for the project.

Certificate number/Version	2021146902/1
Your project number	114739
Your project name	WS 1
Your order number	
Samples received on	10-Sep-2021

This Certificate of Analysis shall not be reproduced except in full, without written approval of the laboratory. Interpretations and opinions are outside the scope of our accreditation, and all results relate only to samples supplied.

Soil samples will be stored for a period of 4 weeks and water samples for a period of 2 weeks after receipt of the samples at our laboratory. Without any additional request, samples will be disposed when the above mentioned periods have expired. If you require Eurofins Analytico to store the samples for a longer period, please complete this page and return it to Eurofins Analytico at least one businessday before the period is due to expire.
The costs of prolonged storage periods may be found in our pricelist.

Storage period:
Date: Name: Signature:

We are confident that we have performed the order in accordance with your expectations. If you have any remaining questions concerning this Certificate of Analysis, please don't hesitate to contact our Customer Service.

Yours sincerely,

Eurofins Analytico B.V.

Ing. A. Veldhuizen
Technical Manager

Annan Translation Office
Sworn Translator - Traducteur Assermenté
Jdeideh - Metn – Lebanon
Tel: 70 – 207 307 / 01 – 876 356

Eurofins
Sanitas Testing

Eurofins Analytico B.V.
attn. Mrs M. Peen
Gildeweg 44-46
3771 NB Barneveld
The Netherlands

REPORTING IDENTIFICATION ASBESTOS SEM
Document no. : 2184435 / 1 / 1.1

Report date : 14-09-2021
Analysis date : 14-09-2021
Date received : 14-09-2021

Number of samples : 1
Page : 1 of 1

Analysis method: in accordance with NEN 5896 (Q) and ISO 14966 (Scanning Electron Microscopy) (Q)
Offered by: Eurofins Analytico B.V.

Your reference : 2021146902
Sample data : WS 1

		Asbestos grade (m / m %)					
M	Sample description	Material	CHR	AMO	CRO	OVE	HB
1	12270026-0904405911	Water	-	-	-	-	-

Explanation of the table and results:

Asbestos found and classified into classes: < 0,1 / 0,1-2 / 2-5 / 5-10 / 10-15 / 15-30 / 30-60 / > 60 of - / + - / + / ++

M = Sample number
m/m % = Weight percent

concentration asb . < 0.1%
HB = Bonded (according to NEN 5896, current version)
AMO =Amosite

+ = Asb . clearly present
n/a Does not apply

asb . = asbestos - = No asb . found
OVE = Other species (Tremolite , Actinolite , Anthophyllite)
CHR = Chrysotile
+ - = Track asb . found
pos = Asbestos present, but cannot be expressed as a percentage
CRO = Crocidolite
++ = Lots of asb . present

Eurofins Sanitas Testing B.V.
J. Rullens

Beirut - Lebanon
03-576550
Sworn Translator
Rola Safa Annan

Remarks :

- Q = analysis falls under the scope of the RVA Testing accreditation under no. L568
- In the qualitative determination of asbestos in material samples, of the used research method, the determination limit is 0.1%.

If the asbestos content is below the limit of determination, the sample is considered not to contain asbestos. In case no asbestos is found in the Polarization Light Microscopy (PLM) method of organically bound materials, fiber type materials and adhesive samples, it is recommended to perform analysis using Scanning Electron Microscopy (SEM).

- The results relate only to the samples offered.
- This report may only be reproduced as a whole.

True translation of the Dutch adjoined document.
Translation is accurate, and translator is competent to translate
The Sworn Translator

eurofins
Sanitas Testing

RAPPORTAGE IDENTIFICATIE ASBEST SEM

Document nr. : 2184435/1/1.1

Eurofins Analytico B.V.
T.a.v. mevrouw M. Peen
Gildeweg 44-46
3771 NB Barneveld
Nederland

Datum rapportage : 14-09-2021
Datum analyse : 14-09-2021
Datum ontvangst : 14-09-2021

Aantal monsters : 1
Pagina : 1 van 1

Analyse methode : conform NEN 5896 (Q) en ISO 14966 (Scanning Elektronen Microscopie) (Q)

Aangeboden door : Eurofins Analytico B.V.
Uw referentie : 2021146902
Monstergegevens : WS 1

			Asbestsoort (m/m%)				
M	**Monsteromschrijving**	**Materiaal**	**CHR**	**AMO**	**CRO**	**OVE**	**HB**
1	12270026 - 0904405911	Water	-	-	-	-	n.v.t.

Toelichting bij de tabel en resultaten:
Aangetroffen asbest ingedeeld in klassen: <0,1 / 0,1-2 / 2-5 / 5-10 / 10-15 / 15-30 / 30-60 / >60 of - / +- / + / ++

M = Monsternummer
m/m% = Gewichtsprocenten
CHR = Chrysotiel
AMO = Amosiet
CRO = Crocidoliet
Asb. = Asbest
OVE = Overige soorten (Tremoliet, Actinoliet, Anthofylliet)
HB = Hechtgebonden (volgens NEN 5896, vigerende versie)
pos = Asbest aanwezig, echter niet in percentage uit te drukken
n.v.t. Niet van toepassing
- = Geen asb. aangetroffen/ concentratie asb. < 0,1%
+- = Spoor asb. aangetroffen
+ = Asb. duidelijk aanwezig
++ = Veel asb. aanwezig

Eurofins Sanitas Testing B.V.
J. Rullens

Opmerkingen:

- Q = analyse valt onder de scope van de RVA Testen accreditatie onder nr. L568
- Bij de kwalitatieve bepaling van asbest in materiaal monsters, van de gebruikte onderzoeksmethode, is de bepalingsgrens 0,1%. Indien het gehalte aan asbest onder de bepalingsgrens ligt, wordt het monster als niet asbesthoudend beschouwd. In geval dat bij de methode met Polarisatie Licht Microscopie (PLM) van organisch gebonden materialen, vezel type materialen en kleefmonsters geen asbest wordt aangetroffen, wordt aanbevolen om analyse te verrichten met behulp van Scanning Elektronen Microscopie (SEM).
- de resultaten hebben uitsluitend betrekking op de aangeboden monsters
- dit rapport mag uitsluitend in zijn geheel worden gereproduceerd

Certificate of analysis

Your project number	114739	Certificate number/Version	2021146902/1
Your project name	WS 1	Start date	10-Sep-2021
Your order number		End date analysis	15-Sep-2021
Your sample taker		Report date	15-Sep-2021/13:57
		Annex	A,C,D
		Page	1/1

Analysis	Unit	1
miscellaneous research		
External research		See annex

No.	Your sample description	Specified sample matrix	Sample nr.
1	WS 1	Waste Water	12270026

Q: Dutch Accreditation Council (RvA) accredited test
A: AP04 accredited test
S: AS SIKB recognized test
V: VLAREL recognized test
W: Walloon region recognized test

Verified
ASM
FZ

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Site www.eurofins.nl

BNP Paribas S.A. 227 9245 25
IBAN: NL71BNPA0227924525
BIC: BNPANL2A
KvK/CoC No. 09088623
BTW/VAT No. NL 8043.14.883.B01

Appendix (A) with the specified sub-sample information belonging to the analysis certificate. 2021146902/

Sample nr.	Your sample description				
Barcode	Drill-#	From	To	Your sampling date	Sample description/Sampling ID
12270026	WS 1				
0904405911					

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BNP Paribas S.A. 227 9245 25
IBAN: NL71BNPA0227924525
BIC: BNPANL2A
KvK/CoC No. 09088623
BTW/VAT No. NL 8043.14.883.B01

Annex (C) method references belonging to certificate of analysis 2021146902/1

Analysis	Method	Technique	Method reference
miscellaneous research			
Contracted out research	W0004	External	External method

Additional information about the applied methods as well as the classification of the accuracy, are listed in our supplement: "Specification of methods of analyses", version June 2020.

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IBAN: NL71BNPA0227924525
BIC: BNPANL2A
KvK/CoC No. 09088623
BTW/VAT No. NL 8043.14.883.B01

Annex (D) remarks concerning the sampling and preservation period 2021146902/1

Non compliance(s) of the criteria is(are) observed that may have influenced the accuracy of the test results of samples mentioned below.

	Sample nr.
The temperature of the samples received at the laboratory, exceded the limit.	12270026

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EMSL Canada Order: 552114526
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attention: Hassan Ktaech
IBI Group
70 Valleywood Drive
Markham, ON L3R 4T5

Project: 135455

Phone: (905) 940-6161
Fax:
Received: 09/01/2021 7:00 PM
Analysis Date: 09/13/2021
Collected:

Test Report: Asbestos Analysis of Bulk Building Materials via EPA 600/R-93/116 Method using PLM and Milling Prep. Quantitation using 400 Point Count Procedure

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
BL-S-01-A *552114526-0001*	Baseline selected sample from Mixed	White Non-Fibrous Homogeneous		99.50% Non-fibrous (Other)	**0.50% Chrysotile**
BL-S-02-B *552114526-0002*	Baseline selected sample from Rubble	White Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BL-S-03-C *552114526-0003*	Baseline selected sample from Audi	White Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BL-T-01-A *552114526-0004*	Baseline True Random sample from Mixed	Orange Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BL-T-02-B *552114526-0005*	Baseline True Random sample from Rubble	White Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BL-T-03-C *552114526-0006*	Baseline True Random sample from Audi	White Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-01-S1-A *552114526-0007*	Bulk Sample from Mixed (Screen)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-02-S1-A *552114526-0008*	Bulk Sample from Mixed (Screen)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-03-S1-A *552114526-0009*	Bulk Sample from Mixed (Screen)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-04-S2-A *552114526-0010*	Bulk Sample from Mixed (Tumbling)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**

Initial report from: 09/13/2021 18:27:25

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Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

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Project: 135455

Phone: (905) 940-6161
Fax:
Received: 09/01/2021 7:00 PM
Analysis Date: 09/13/2021
Collected:

Test Report: Asbestos Analysis of Bulk Building Materials via EPA 600/R-93/116 Method using PLM and Milling Prep. Quantitation using 400 Point Count Procedure

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
BLK-05-S2-A *552114526-0011*	Bulk Sample from Mixed (Tumbling)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-06-S2-B *552114526-0012*	Bulk Sample from Rubble (Tumbling)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-07-S1-B *552114526-0013*	Bulk Sample from Rubble (Screen)	Gray Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-08-S1-B *552114526-0014*	Bulk Sample from Rubble (Tumbling)	Brown Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-09-S1-C *552114526-0015*	Bulk Sample from Audi (Screen)	Brown Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**<0.25% Chrysotile**
BLK-10-S2-C *552114526-0016*	Bulk Sample from Audi (Tumbling)	Brown Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-01-C1-A *552114526-0017*	Crushed Sample from Mixed (Screen)	Brown Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-02-C1-A *552114526-0018*	Crushed Sample from Mixed (Screen)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-03-C1-A *552114526-0019*	Crushed Sample from Mixed (Screen)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-04-C2-A *552114526-0020*	Crushed Sample from Mixed (Tumbling)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**

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Customer ID:	55CLEG25
Customer PO:	135455
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Attention:	Hassan Ktaech IBI Group 70 Valleywood Drive Markham, ON L3R 4T5	**Phone:**	(905) 940-6161
		Fax:	
		Received:	09/01/2021 7:00 PM
		Analysis Date:	09/13/2021
		Collected:	
Project:	135455		

Test Report: Asbestos Analysis of Bulk Building Materials via EPA 600/R-93/116 Method using PLM and Milling Prep. Quantitation using 400 Point Count Procedure

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
BLK-05-C2-A *552114526-0021*	Crushed Sample from Mixed (Tumbling)	Brown Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-06-C1-B-Texture *552114526-0022*	Crushed Sample from Rubble (Screen)	White Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-07-C1-B *552114526-0023*	Crushed Sample from Rubble (Screen)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-08-C2-B *552114526-0024*	Crushed Sample from Rubble (Tumbling)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-09-C1-C *552114526-0025*	Crushed Sample from Audi (Screen)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**
BLK-10-C2-B *552114526-0026*	Crushed Sample from Audi (Screen)	Beige Non-Fibrous Homogeneous		100.0% Non-fibrous (Other)	**None Detected**

Analyst(s)

Delaney Breen (6)
Dmitriy Suzdalev (7)
Elizabeth Mierzynski (3)
Stephanie Achaiya (10)

Matthew Davis or other approved signatory

Initial report from: 09/13/2021 18:27:25

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Customer PO: 135455
Project ID:

Attn: *Hassan Ktaech*
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Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: **135455**

Analyzed: 09/28/21

SUMMARY REPORT : TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Sample ID	Minerals Present	Results	Structures	Reporting Limit	Asbestos Weight	Comments
BL-S-02-B 552114526-0002 Baseline selected sample from Rubble	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BL-S-03-C 552114526-0003 Baseline selected sample from Audi	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BL-T-01-A 552114526-0004 Baseline True Random sample from Mixed	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BL-T-02-B 552114526-0005 Baseline True Random sample from Rubble	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BL-T-03-C 552114526-0006 Baseline True Random sample from Audi	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-01-S1-A 552114526-0007 Bulk Sample from Mixed (Screen)	Chrysotile	Regulated Asbestos	22	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**22**		**< 0.1%**	
		Undetermined	0		----------	
BLK-02-S1-A 552114526-0008 Bulk Sample from Mixed (Screen)	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-03-S1-A 552114526-0009 Bulk Sample from Mixed (Screen)	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	

A. Balayboa N.D'Amico
Analyst

Approved Signatory

TEM CARB Spreadsheet Version: 7.2

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Customer PO: 135455
Project ID:

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Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: **135455**

Analyzed: 09/28/21

SUMMARY REPORT : TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Sample ID	Minerals Present	Results	Structures	Reporting Limit	Asbestos Weight	Comments
BLK-04-S2-A	*No Structures Detected*	Regulated Asbestos	0	0.1%	< 0.1%	
552114526-0010		Other Minerals	0		< 0.1%	
Bulk Sample from Mixed (Tumbling)		**Total**	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-05-S2-A	*No Structures Detected*	Regulated Asbestos	0	0.1%	< 0.1%	
552114526-0011		Other Minerals	0		< 0.1%	
Bulk Sample from Mixed (Tumbling)		**Total**	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-06-S2-B	*No Structures Detected*	Regulated Asbestos	0	0.1%	< 0.1%	
552114526-0012		Other Minerals	0		< 0.1%	
Bulk Sample from Rubble (Tumbling)		**Total**	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-07-S1-B	*No Structures Detected*	Regulated Asbestos	0	0.1%	< 0.1%	
552114526-0013		Other Minerals	0		< 0.1%	
Bulk Sample from Rubble (Screen)		**Total**	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-08-S1-B	*Chrysotile*	Regulated Asbestos	2	0.1%	< 0.1%	
552114526-0014		Other Minerals	0		< 0.1%	
Bulk Sample from Rubble (Tumbling)		**Total**	**2**		**< 0.1%**	
		Undetermined	0			
BLK-10-S2-C	*Chrysotile*	Regulated Asbestos	1	0.1%	< 0.1%	
552114526-0016		Other Minerals	0		< 0.1%	
Bulk Sample from Audi (Tumbling)		**Total**	**1**		**< 0.1%**	
		Undetermined	0		----------	
BLK-01-C1-A	*Chrysotile*	Regulated Asbestos	4	0.1%	< 0.1%	
552114526-0017		Other Minerals	0		< 0.1%	
Crushed Sample from Mixed (Screen)		**Total**	**4**		**< 0.1%**	
		Undetermined	0		----------	
BLK-02-C1-A	*Chrysotile*	Regulated Asbestos	3	0.1%	< 0.1%	
552114526-0018		Other Minerals	0		< 0.1%	
Crushed Sample from Mixed (Screen)		**Total**	**3**		**< 0.1%**	
		Undetermined	0		----------	

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TEM CARB Spreadsheet Version: 7.2

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Customer PO: 135455
Project ID:

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IBI Group
70 Valleywood Drive
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Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: **135455**

Analyzed: 09/28/21

SUMMARY REPORT : TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Sample ID	Minerals Present	Results	Structures	Reporting Limit	Asbestos Weight	Comments
BLK-03-C1-A 552114526-0019 Crushed Sample from Mixed (Screen)	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-04-C2-A 552114526-0020 Crushed Sample from Mixed (Tumbling)	Chrysotile	Regulated Asbestos	2	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**2**		**< 0.1%**	
		Undetermined	0		----------	
BLK-05-C2-A 552114526-0021 Crushed Sample from Mixed (Tumbling)	Chrysotile	Regulated Asbestos	7	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**7**		**< 0.1%**	
		Undetermined	0		----------	
BLK-06-C1-B-Texture 552114526-0022 Crushed Sample from Rubble (Screen)	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-07-C1-B 552114526-0023 Crushed Sample from Rubble (Screen)	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-08-C2-B 552114526-0024 Crushed Sample from Rubble (Tumbling)	No Structures Detected	Regulated Asbestos	0	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**0**		**< 0.1%**	
		Undetermined	0		----------	
BLK-09-C1-C 552114526-0025 Crushed Sample from Audi (Screen)	Chrysotile	Regulated Asbestos	2	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**2**		**< 0.1%**	
		Undetermined	0		----------	
BLK-10-C2-B 552114526-0026 Crushed Sample from Audi (Screen)	Chrysotile	Regulated Asbestos	1	0.1%	< 0.1%	
		Other Minerals	0		< 0.1%	
		Total	**1**		**< 0.1%**	
		Undetermined	0		----------	

A. Balayboa N.D'Amico
Analyst

Approved Signatory

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Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attn: *Hassan Ktaech*
IBI Group
70 Valleywood Drive
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Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BL-S-02-B**	**Reporting Limit :**	0.1%
Sample Description:	**Baseline selected sample from Rubble**		
EMSL Sample Number:	552114526-0002	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	N/A	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Undetermined Elongate Mineral	None Detected	-	

Laboratory Manager or Other Approved Signatory

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EMSL Order: 552114526
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attn: *Hassan Ktaech*
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70 Valleywood Drive
Markham, ON, L3R 4T5

Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BL-S-03-C**	**Reporting Limit :**	**0.1%**
Sample Description:	**Baseline selected sample from Audi**		
EMSL Sample Number:	552114526-0003	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

Laboratory Manager or Other Approved Signatory

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EMSL Order: 552114526
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

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70 Valleywood Drive
Markham, ON, L3R 4T5

Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number: BL-T-01-A **Reporting Limit : 0.1%**
Sample Decription: Baseline True Random sample from Mixed

EMSL Sample Number:	552114526-0004	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

Laboratory Manager or Other Approved Signatory

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EMSL Order: 552114526
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attn: *Hassan Ktaech*
IBI Group
70 Valleywood Drive
Markham, ON, L3R 4T5

Phone: (905) 940-6161
Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number: BL-T-02-B **Reporting Limit : 0.1%**
Sample Decription: Baseline True Random sample from Rubble

EMSL Sample Number:	552114526-0005	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<	
Amosite	None Detected	<	
Crocidolite	None Detected	<	
Tremolite	None Detected	<	
Actinolite	None Detected	<	
Anthophyllite	None Detected	<	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number: BL-T-03-C **Reporting Limit : 0.1%**
Sample Decription: Baseline True Random sample from Audi

EMSL Sample Number:	552114526-0006	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
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Project: 135455

Analyzed: 09/28/2021

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Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-01-S1-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Mixed (Screen)**		
EMSL Sample Number:	552114526-0007	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**22**	**< 0.1%**	**50**
Chrysotile	22	< 0.1%	50
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-02-S1-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Mixed (Screen)**		
EMSL Sample Number:	552114526-0008	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	N.D'Amico

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-03-S1-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Mixed (Screen)**		
EMSL Sample Number:	552114526-0009	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	N.D'Amico

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-04-S2-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Mixed (Tumbling)**		
EMSL Sample Number:	552114526-0010	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	N.D'Amico

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-05-S2-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Mixed (Tumbling)**		
EMSL Sample Number:	552114526-0011	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	N.D'Amico

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-06-S2-B**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Rubble (Tumbling)**		
EMSL Sample Number:	552114526-0012	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	N.D'Amico

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
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Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-07-S1-B**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Rubble (Screen)**		
EMSL Sample Number:	552114526-0013	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	N.D'Amico

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-08-S1-B**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Bulk Sample from Rubble (Tumbling)**		
EMSL Sample Number:	552114526-0014	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**2**	**< 0.1%**	**18**
Chrysotile	2	< 0.1%	**18**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Fax: N/A
Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number: BLK-10-S2-C
Sample Decription: Bulk Sample from Audi (Tumbling)
Reporting Limit : 0.1%

EMSL Sample Number: 552114526-0016
Sample Matrix: BULK
Aspect ratio for fiber definition: 3:1
Area of collection filter (mm²): 1288
Minimum Length (µm): 0.5
Grid Opening Area (mm²): 0.0128
Gravimetric Reduction Ratio: 1.00
Grid Openings Analyzed: 10
Mass contributed by Largest fiber: 0%
Analyst: A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**1**	**< 0.1%**	**165**
Chrysotile	1	< 0.1%	**165**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number: **BLK-01-C1-A** **Reporting Limit : 0.1%**
Sample Decription: **Crushed Sample from Mixed (Screen)**

EMSL Sample Number:	552114526-0017	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**4**	**< 0.1%**	**21**
Chrysotile	4	< 0.1%	**21**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-02-C1-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Mixed (Screen)**		
EMSL Sample Number:	552114526-0018	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**3**	**< 0.1%**	**25**
Chrysotile	3	< 0.1%	**25**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-03-C1-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Mixed (Screen)**		
EMSL Sample Number:	552114526-0019	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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EMSL Order: 552114526
Customer ID: 55CLEG25
Customer PO: 135455
Project ID:

Attn: *Hassan Ktaech*
IBI Group

Phone: (905) 940-6161
Fax: N/A

70 Valleywood Drive
Markham, ON, L3R 4T5

Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-04-C2-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Mixed (Tumbling)**		
EMSL Sample Number:	552114526-0020	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**2**	**< 0.1%**	**33**
Chrysotile	2	< 0.1%	**33**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-05-C2-A**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Mixed (Tumbling)**		
EMSL Sample Number:	552114526-0021	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**7**	**< 0.1%**	**27**
Chrysotile	7	< 0.1%	**27**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-06-C1-B-Texture**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Rubble (Screen)**		
EMSL Sample Number:	552114526-0022	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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70 Valleywood Drive
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Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-07-C1-B**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Rubble (Screen)**		
EMSL Sample Number:	552114526-0023	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-08-C2-B**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Rubble (Tumbling)**		
EMSL Sample Number:	552114526-0024	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**None Detected**	**< 0.1%**	
Chrysotile	None Detected	<0.1%	
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-09-C1-C**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Audi (Screen)**		
EMSL Sample Number:	552114526-0025	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**2**	**< 0.1%**	**73**
Chrysotile	2	< 0.1%	**73**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

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Collected: N/A
Received: 09/01/21 19:00

Project: 135455

Analyzed: 09/28/2021

TEM EPA 600/R-93/116

Analysis of Bulk Material Utilizing Analytical Electron Microscopy (Section 2.5.5.2) with Milling Prep

Detailed Sample Report

Customer Sample Number:	**BLK-10-C2-B**	**Reporting Limit :**	**0.1%**
Sample Decription:	**Crushed Sample from Audi (Screen)**		
EMSL Sample Number:	552114526-0026	Sample Matrix:	BULK
Aspect ratio for fiber definition:	3:1	Area of collection filter (mm²):	1288
Minimum Length (µm):	0.5	Grid Opening Area (mm²):	0.0128
Gravimetric Reduction Ratio:	1.00	Grid Openings Analyzed:	10
Mass contributed by Largest fiber:	0%	Analyst:	A. Balayboa

Mineral Type	Stuctures	Weight %	Average Aspect Ratio
Total Regulated Asbestos	**1**	**< 0.1%**	**25**
Chrysotile	1	< 0.1%	**25**
Amosite	None Detected	<0.1%	
Crocidolite	None Detected	<0.1%	
Tremolite	None Detected	<0.1%	
Actinolite	None Detected	<0.1%	
Anthophyllite	None Detected	<0.1%	
Total Other Elongate Mineral Types	**None Detected**	**< 0.1%**	
Unknown Elongate Mineral	None Detected	-	

Laboratory Manager or Other Approved Signatory

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EMSL Canada Or	552114796
CustomerID:	55CLEG25
CustomerPO:	135455
ProjectID:	

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IBI Group
70 Valleywood Drive
Markham, ON L3R 4T5

Phone: (905) 940-6161
Fax:
Received: 9/2/2021 09:00 AM
Collected:

Project: **135455**

Test Report: Toxicity Characteristic Leachate Procedure (1311/7000B)

Client SampleDescription	*Collected*	*Analyzed*	*RDL*	*Lead Concentration*
-A *552114796-0001*		9/10/2021	0.40 mg/L	<0.40 mg/L
-B *552114796-0002*		9/10/2021	0.40 mg/L	<0.40 mg/L
-C *552114796-0003*		9/10/2021	0.40 mg/L	0.41 mg/L

Rowena Fanto, Lead Supervisor
or other approved signatory

Samples analyzed by EMSL Canada Inc. Mississauga, ON

Initial report from 09/15/2021 09:08:11

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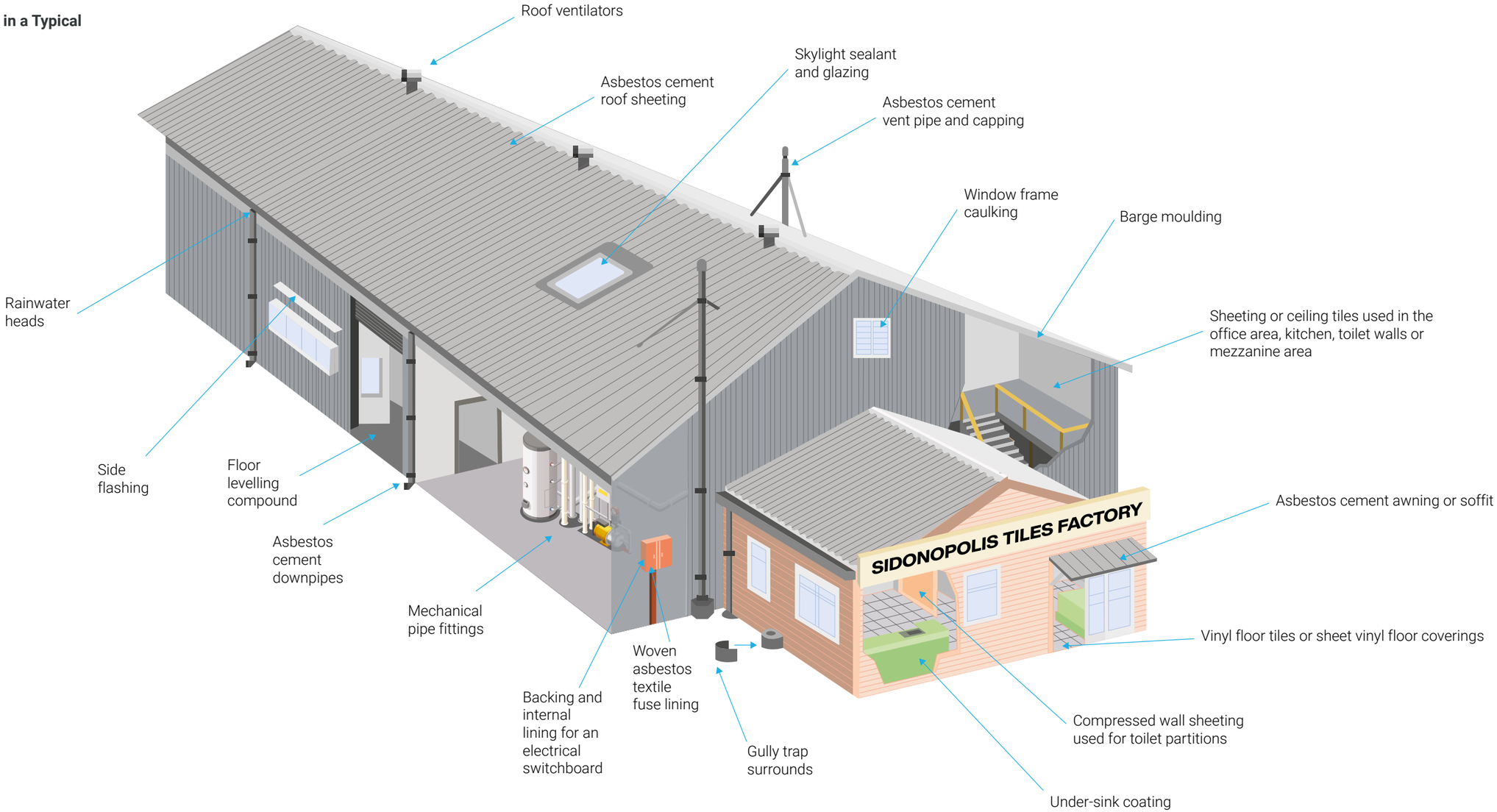
Salzsäure
Achtung Vorsicht
Bei Abstellung u. ausblei-
ben des Hochdruckwassers
sofort Ventile an dem
Mischbettfilter schließen.

Appendix B
Managing Asbestos in a Lebanese Context

Original Image: Michael Pedrotti / Adobe Stock

Common Sources of Asbestos in a Typical Industrial Facility in Lebanon



The above diagram shows where asbestos or asbestos-containing material (ACM) can commonly be found in a facility in Lebanon. The locations and materials shown in the diagram are not comprehensive and should be used as a general guide only.

The risk to health is low if the asbestos or ACM is in good condition and undisturbed, as it is unlikely that any airborne asbestos fibres will be released. In that case, it is usually safer to leave the asbestos or ACM where it is and assess its condition annually.

If the ACM deteriorates or is disturbed (e.g., during demolition, renovations, or repairs), asbestos fibres can be released into the air. Breathing in these fibres is a serious health risk. Before disturbing any material that may contain asbestos, consult a specialist to understand how to do this safely.

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ROLES AND RESPONSIBILITIES FOR WORKING WITH ASBESTOS

Project Manager

Steps to take prior to starting a project

1. If the planned works will disturb potential ACM, retain the services of an asbestos specialist to carry out an asbestos survey.
2. Make sure the results of the survey are communicated to—and understood by—all parties involved in the project.
3. If ACM is present and the planned works will likely disturb the hazard, retain the services of an asbestos-abatement contractor to safely remove and dispose of the ACM prior to disturbing it.

Workers

Steps to take if you encounter previously undiscovered ACM

1. Do not disturb the material. Advise anyone working in the area of the presence of ACM.
2. Ask the project manager if the material has been sampled and analyzed for asbestos content.
3. Ensure the material remains undisturbed by isolating the area until the asbestos has been safely removed or its presence ruled out.

Steps to take if you disturb ACM

1. Immediately wet down the material, inform coworkers, and evacuate everyone from the area.
2. Ask the project manager if the material has been sampled and analyzed for asbestos content.
3. Ensure the material remains undisturbed by isolating the area until the asbestos has been safely removed or its presence ruled out.

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